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Research Briefs

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Nutrition and Health

Tooth loss may be an important early warning of bone loss in women as they age, according to a study of 329 women past menopause. The findings suggest that dentists may become key in identifying high-risk women before they develop osteoporosis. Bone loss in the study women correlated directly with tooth loss: The more teeth they had lost the less bone they had in the spine, wrist and hip--the three areas most prone to fractures from osteoporosis. Overall, tooth loss increased as a function of the women's age and history of cigarette smoking and decreased in step with their level of education.

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Volunteers in the first human study of Oatrim--an ARS-developed fat replacer--not only had a drop in cholesterol. They also lost weight, averaging 4.5 pounds for the group, even though their calorie intake was increased during the study in an effort to stem weight loss. Furthermore, their glucose tolerance--the ability to process sugar from a meal--improved, thus reducing their risk of diabetes. About one-half cup a day of Oatrim added to a variety of foods significantly reduced artery-clogging LDL cholesterol in the 24 volunteers, who were selected because

of their mildly elevated cholesterol. But it did not lower the beneficial HDL cholesterol. Oatrim consists of amylopectin--shortened fragments of starch--and beta glucans, the principal fiber in oats and barley that gives these grains their cholesterol-lowering property. ARS has licensed Oatrim to a joint venture between ConAgra and A.E. Staley and to a partnership between Quaker Oats and Rhone Poulenc. ConAgra puts Oatrim in several of its Healthy Choice line of products. And the Quaker Oats/Rhone Poulenc partnership expects to have several products containing Oatrim out this year.

*Beltsville Human Nutrition Research Center, Beltsville, MD
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An overenthusiastic enzyme may be contributing to the age-related decline in people's ability to fight infections. A study of laboratory mice shows that the enzyme, cyclooxygenase, is indirectly involved in suppressing T cells. T cells are the immune system's front-line defense, but they get sluggish after age 60. The enzyme stimulates production of a hormone-like substance (PGE 2) that suppresses T cells, so more enzyme means more of the suppressant. That's what researchers found when they compared PGE 2-producing cells from young and old mice. The old cells produced more PGE 2 apparently because of too much enzyme activity. Knowing how the aging body suppresses T cells will help researchers find ways to reverse the trend.

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A new study provides more evidence that blood levels of HDL cholesterol--the beneficial kind--rise in step with blood levels of vitamin C--at least to a point. Researchers analyzed blood samples from 477 men and women between the ages of 20 and 65 and compared their cholesterol profiles with their vitamin C levels. Among the women, HDL cholesterol increased along with vitamin C levels until the latter reached 1 milligram per deciliter--easily attainable by consuming five fruits and vegetables daily. Then HDL leveled off. Among the men, by contrast, HDL cholesterol continued to increase linearly as blood vitamin C levels increased. What's more, higher vitamin C levels in the men were associated with lower total cholesterol and LDL

cholesterol--the damaging kind--as well as a more favorable ratio of total cholesterol to HDL cholesterol. This is the first time researchers have seen a gender difference in vitamin C's effect on cholesterol levels out of many such studies. And they have no explanation for it. They went on to test the effects of supplementing the individuals with the lowest blood vitamin C levels. Results are expected later this year.

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Very premature infants have a better outlook for strong bones if they get more calcium and phosphorus in their intravenous feedings shortly after birth. These tiny people have bones that fracture easily because of a low bone mineral content--one of many consequences of trying to develop organs and systems outside of mother's uterus. Researchers attempting to better simulate the uterine environment found a way to get 35 percent more calcium and phosphorus to dissolve in the intravenous solutions given to very-low-birth-weight infants for 2 to 4 weeks after birth. They tested the high-mineral solutions on a group of 12 newborn infants weighing less than 2 pounds, while a similar group of 12 got standard solutions. Bone mineral content and the rate of bone mineral increase were significantly higher in the group getting the high-mineral solution. This group also retained more calcium and phosphorus, coming closer to levels that occur in the uterus than the group on the standard solution. The results promise to reduce the incidence of fragile bones in very-low-birth-weight infants if the infants are continued on mineral-fortified milk when they are able to receive milk feeding.

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A significant number of older people may need more of three B vitamins than they now consume to protect against heart disease and stroke. In a study of 1,160 elderly, nearly 30 percent had high blood levels of the amino acid homocysteine--known to contribute to blocked arteries in the heart and brain. And two-thirds of those with high homocysteine--or 20 percent of the study group--were below the group average in at least one of three B vitamins--folate (folic acid and its relatives), vitamin B₆ or vitamin B₁₂. Too little of these vitamins can cause a buildup of homocysteine. But people can get the amounts needed from foods: Half the people with the highest B vitamin status took no supplements. Liver and kidney--are the richest sources of all three vitamins. Dark green leafy vegetables are an excellent low-fat source of folate. Researchers analyzed blood samples of men and women--67 to 96 years old--and estimated the participants' vitamin intakes from dietary questionnaires. Those who had the

lowest blood levels or the lowest intakes of the three B vitamins were six times more likely to have high homocysteine than those in the highest categories. Participants needed to have better than average levels of all three vitamins to achieve the lowest homocysteine levels. *Human Nutrition Research Center on Aging at Tufts
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The kind of oil used in a cholesterol-reducing diet doesn't matter much, once saturated fat is out of the picture. That's according to a four-month study of men and women who began with moderately high cholesterol levels. Researchers compared corn oil (high in polyunsaturated fat), canola oil and olive oil (both high in monounsaturated fat) as the primary fat in the National Cholesterol Education Program's Step 2 diet. This diet calls for fat intake to be less than 30 percent of total calories, with saturated fat less than seven percent. The 15 volunteers consumed the diet enriched with each oil for five weeks each. Reductions in their "bad" LDL cholesterol did not differ statistically among the oils--17 percent for corn oil versus 16 percent for canola oil and 13 percent for olive oil. And, contrary to some reports that monounsaturated fat "spares" the "good" HDL cholesterol, it dropped seven percent with canola oil--about the same as the nine percent drop with corn oil.

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Tomorrow's Foods

A new reduced-fat mozzarella cheese bakes, tastes and feels like the full-fat product but has less than half the fat. Only about 30 percent of the calories in this all-natural cheese come from fat, compared with 66 percent for full-fat mozzarellas and 57 percent for reduced-fat products made with part skim milk. And it contains about half the salt of commercially available mozzarella cheeses. This all-natural mozzarella is superior in flavor, melting qualities and texture to commercial, reduced-fat mozzarella cheeses. By lowering cooking temperatures, scientists were able to enhance the normal breakdown of milk proteins in the curd, resulting in a high-quality cheese. USDA's Food and Nutrition Service is evaluating the new product in Philadelphia public schools as part of its effort to provide school children nutritious, good-tasting meals with less fat and calories.

*Eastern Regional Research Center in Philadelphia, PA
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Berry Citrus of Winter Haven, FL, has been licensed to use an ARS-patented process to remove the peel, including the albedo, from oranges and grapefruit. Albedo is the

white, spongy portion of the peel that clings to the fruit. A natural enzyme called pectinase removes the peel and albedo, leaving fruit intact without any loss of juice. Previously, citrus sections were obtained by steaming, machine peeling and soaking the fruit in hot lye, then cutting it by hand--which could waste juice and adversely affect flavor. Now the enzyme process yields nutritious, uncut, whole fruit and sections without any loss of flavor or juice.

*Citrus and Subtropical Products Research Laboratory
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A lemon-colored, giant, grapefruit-looking citrus fruit--the pummelo--may join exotic mangos and star fruit on produce shelves after the turn of the century. An ARS scientist developed and released breeding stock of this subtropical fruit to withstand more cold than its parents, which originally hailed from Malaysia and Indonesia. Plant breeders will need several years to develop a commercial variety that could be grown in southern Florida and parts of California where the climate is subtropical. Weighing in at about 3 pounds each, the sphere-shaped pummelo--a.k.a. shaddock--has been highly prized in the Orient for years. Its fruit is yellow, sweet and solid and is eaten by sections that easily pull apart.

*U.S. Horticultural Research Laboratory, Orlando, FL
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A new rootstock for peach trees and related species should guarantee the supply of domestically produced peaches, increase grower profits and lower consumer prices. The rootstock has resistance to Peach Tree Short Life, which costs growers millions of dollars each year. The disease is present in almost every orchard in the southeastern United States and kills thousands of peach trees annually. In cooperation with the Clemson University Agricultural Experiment Station, ARS scientists released the new rootstock last year. It is expected to be of great value to peach producers throughout most of the world.

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Food Freshness and Safety

Oranges and other citrus will stay fresh up to three weeks at room temperature with a new ARS-developed coating. By contrast, fruit treated with commercially available coatings look shrunken and discolored after three weeks. Another advantage of the new coating is that it reduces the chance of off-flavors developing, since it allows better gas exchange between the air and the fruit. All the ingredients used in the coating have been approved by the Food and Drug Administration. Fresh Mark Corp., a manufacturing company in Mascotte, FL, is working with ARS scientists to further develop the potential of this and other new fruit coatings.

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The potential of bacterial biocontrol strains to halt dry rot in stored potatoes is being evaluated under a cooperative agreement with United Agricultural Products, Inc., of Greeley, CO. Dry rot, caused by the fungus *Fusarium sambucinum*, normally ruins five to 20 percent of the potatoes and can infect up to 60 percent. The fungus gains entry through wounds in the potatoes' skin and is often able to resist current chemical controls. ARS researchers applied for a patent on the use of several bacterial strains that show promise for limiting or preventing the disease. Four of these bacteria will be tested in large-scale trials performed under commercial storage conditions.

*Fermentation Biochemistry Research, Peoria, IL
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A neem seed oil coating on Golden Delicious apples reduced two types of fungal storage rots by 50 percent. ARS scientists did this research on new ways to protect fresh produce, since use of fungicides to control storage rots has been severely restricted. Seed and leaf extracts of the neem tree are known to have insecticidal properties, and clarified neem seed oil has recently been shown to also have fungicidal properties. This is the first time neem has been used to protect fruit against storage pathogens. Fruit dipped in neem oil produced 80 percent less ethylene, the compound that causes fruit to ripen. ARS scientists think the neem oil provides a barrier to ethylene rather than actively inhibiting its production.

*Horticultural Crops Quality Laboratory, Beltsville, MD
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A new russet potato can be grown without pesticides. It resists *Verticillium* wilt, early blight, black dot and common powdery scab as well as major potato viruses, which are transmitted by insects. This is important because two pesticides that fight potato diseases are being taken off the

market. What's more, the new potato produces french fries superior to those of the standard Russet Burbank and is higher in protein and vitamin C. ARS researchers developed the potato with help from the Washington State Potato Commission and other federal and state researchers. The new potato is expected to be released soon to growers.
Vegetable and Forage Crops Production Research Laboratory, Prosser, WA
Charles R. Brown, (509) 786-3454

A new species of nematode outperforms another species that growers use to control citrus root weevil. In laboratory and greenhouse tests, the nematode killed 80 percent of weevil larvae, compared to only 60 percent killed by the current nematode species. Orange, grapefruit, lemon and lime growers in Florida lose millions of dollars annually in crop damage by the weevil. Its larvae--the most damaging stage of the pest--feast on citrus roots, interfering with the transport of nutrients and water to the rest of the tree. This results in fewer and smaller fruit, which can cause growers to abandon affected trees. ARS scientists at Weslaco, TX, originally isolated the new nematode species, found in the Rio Grande Valley, and are using it effectively against corn earworm and fall armyworm moths.

U.S. Horticultural Research Laboratory, Orlando, FL
William J. Schroeder, (407) 897-7379

Tomato breeding lines that resist the voracious Colorado potato beetle have been developed by ARS scientists. Seed from these four lines is available to plant breeders to incorporate into new tomato varieties. The Colorado potato beetle is a significant pest for tomato growers in mid-Atlantic states. Of the new germplasm lines, three also resist *Fusarium* wilt and *Stemphylium solani*; one line resists these two diseases as well as *Verticillium* wilt.

Vegetable Lab, Beltsville, MD
William W. Cantelo, (301) 344-8957

A hot forced-air treatment kills Mexican fruit fly larvae in grapefruit as well as fumigation with methyl bromide. The ARS-developed treatment has been approved as a substitute for methyl bromide by USDA's Animal and Plant Health Inspection Service. Quarantine and commodity treatments are the second largest agricultural use for this chemical. But it has been identified as harmful to the atmosphere, so its production and use must be phased out by the year 2001. The new treatment is a needed alternative for protecting fruit against Mexican fruit flies and preserving both domestic and export markets.

Subtropical Agricultural Research Laboratory, Weslaco, TX
Robert L. Mangan, (210) 565-2647

Gaseous natural compounds from tomato and tobacco plants stopped the growth of two soil-borne fungi in lab tests. One fungus rots tomatoes and strawberries in storage. The other causes leaf diseases on ornamental plants. In lab tests, ARS and University of Kentucky scientists found that the volatile compounds inhibited the germination and growth of fungal spores. Chemically described as 6- and 9-carbon aldehydes and alcohols, the volatiles were isolated from tomato and tobacco leaves. In nature, the plants release a blend of these volatiles immediately after being damaged or wounded, for example, by chewing of insects. This reaction may prevent diseases caused by fungi that initially enter a plant's wounds as spores. The scientists are continuing to study how--or if--they can harness the volatiles as nature-based fungicides.

Tobacco and Forage Research, Lexington, KY
Roger A. Andersen, (606) 257-1902

Six muskmelon lines from India, Afghanistan, China and Canada may be a breeder's dream come true for stopping a damaging fungal disease. Those were the most promising of 275 melon germplasm samples screened for genetic resistance to *Alternaria* leaf blight. This disease attacks melon leaves in humid, high-rainfall areas of the Eastern and Midwestern United States, defoliating plants and reducing yields. The top six lines are apparently so resistant that they would not require fungicides, compared to susceptible varieties that would be wiped out without those chemicals. After further studies, researchers plan to release the six resistant lines to breeders.

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